

DELTA PROTECTION COMMISSION

14215 RIVER ROAD
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March 14, 1997

To: Delta Protection Commission

From: Margit Aramburu, Executive Director

Subject: Consideration and Possible Approval of Consulting Contract with Sonoma State University (Professor Chris Kjeldsen, Project Manager) to Carry Out Pre-Project Investigations for In-Channel Island Protection and Restoration

Proposed Action:

The Commission should consider entering into a contract with Sonoma State University, Professor Chris Kjeldsen, project manager, to carry out pre-project evaluation at an in-channel island to be the site of an enhancement and protection project, and prepare a Category III grant application for the next phase. Proposed cost of the contract is approximately \$27,000. All work will be completed before the end of the current fiscal year.

Background Information on In-channel Islands:

NOTE: The Commission received a briefing on in-channel islands at the October 1996 meeting. For a copy of the staff report prepared for that meeting, please contact staff.

The in-channel islands are remnants of the original Delta wetland habitats. These narrow islands were created when clamshell dredges constructed the levees along the Delta islands. Some in-channel islands were created when levees were created in the middle of reclaimed islands.

The in-channel islands are disappearing, and along with them, unique Delta habitat areas. State Lands Commission staff research on old and current aerial photographs illustrate this "shrinkage".

There are many causes of erosion, some natural and some not. Erosion occurs at different rates and in different ways depending on the individual situation. Natural causes include: high water from winter storm runoff; the twice daily tidal cycle; wind-created waves; and burrowing by aquatic mammals. Non-natural causes include:

unseasonable high water due to upstream releases from dams and reservoirs; boat wakes; diversion of large amounts of water into certain channels as part of the water projects; and construction of new water control elements, such as the cross-channel.

Delta Protection Commission's Position on In-channel Islands:

The Commission adopted a recommendation in the Land Use and Resource Management Plan for the Primary Zone of the Delta which recognizes the value of the islands. The recommendation states:

"Undeveloped channel islands provide unique opportunities for permanent wildlife habitat in the Primary Zone. A strategy should be developed to encourage permanent protection and management of the channel islands. Protection may include: acquisition, conservation easements or memoranda of understanding. Management may include: protection from erosion, controlling human access, or habitat management, such as planting native plants and removing exotic plants. Some larger, reclaimed channel islands may be suitable for mixed uses, such as recreation and habitat. Any development on channel islands must ensure long-term protection of the wildlife habitat (Environment Recommendation R-3).

The Overall Project Regarding In-Channel Islands:

The San Francisco Estuary Project (SFEP) Delta Work Group has put together a work plan and is seeking funding to carry out the program which includes: a demonstration restoration/protection project; an evaluation of the demonstration project; and development of a handbook, or plan, which describes and explains physical construction techniques and provides assistance with regulatory issues. The end result would help landowners and others interested in protecting in-channel islands to put projects "on the ground".

While the demonstration project has been identified as a likely candidate for a CALFED Category III grant in Round III, those applications will not be submitted until March or April, 1997. The project before the Commission is the pre-project evaluation, to develop the "before" conditions, and to prepare the Category III grant application. A project site will be selected by the SFEP work group on April 3, 1997.

Delaying funding of the pre-project evaluation could delay the project enough to preclude conclusion this construction year. There is no specific date for submittal of applications for Category III grants, but the likely submittal date will be in April, 1997.

Funding for a third component, preparation of a guidebook, has been submitted to the EPA. That application was submitted by SFEP staff.

The Commission should consider if the Delta Protection Commission should fund the proposed work by Professor Kjeldsen. The work on in-channel islands is compatible with the Commission's adopted positions on in-channel islands and protection and enhancement of Delta habitat.

Description of the Proposed Project:

Attached is a detailed description of the proposed work. This work plan was prepared with assistance from Department of Water Resources staff. The proposal has been modified to eliminate any work beyond this fiscal year, and to include funding for the consultant to assist in preparation of the CALFED Category III grant application for the demonstration restoration/protection project.

The site for the in-channel island project has not yet been selected. A subgroup of the SFEP In-channel Island Work Group, including scientists and interested parties has reviewed a number of possible sites and selected three islands. The final site will be selected by the entire SFEP work group on April 3, 1997.

Status of Commission Budget for FY 96-97:

Projections by Commission staff, confirmed by Department of Conservation staff, indicate the Commission will have approximately \$70,000 in unexpended funds at the end of the fiscal year.

The Commission's budget has \$50,000 designated for consultant services; none of the FY 96-97 funds designated for consultants has been contracted or spent. Please note that if the Commission does not expend its budgeted funds in this fiscal year, the funds must be returned.

Attachments

**RESEARCH PROPOSAL SUBMITTED TO THE
Delta Protection Commission
14215 River Road
Walnut Grove, CA 95690**

Title of Proposal:

**Relict Sacramento-San Joaquin Delta In Channel
Islands:
Analysis of Opportunities for Protection and
Management.**

Principal Investigator:

**Chris K. Kjeldsen
Professor of Biology
and
Two Associate Investigators:
Masters of Arts Candidates in Biology,
Department of Biology, Sonoma State University**

Institution:

**Sonoma State University
Rohnert Park California, 94928
(707) 664 -2320**

Estimated Completion Date:

1998

Duration:

FY 1997 to 1998

Total Budget:

\$ 24,900

**(\$ 26,725 due to change in overhead if University
Services Sacramento Used, see Budget Page)**

Endorsements:

Principal Investigator

**Chris Kjeldsen, Professor
Biology, SSU**

Date

Institutional Approval

**Katharyn Crabbe, Ph.D.
Vice President
SSU Academic Foundation, Inc.**

Date

Abstract:

Relict Sacramento-San Joaquin Delta In Channel Islands: Analysis of Opportunities for Protection and Management.

Relict Delta in-channel islands, in-channel berms ("dredger berms") or orphan islands are the only remnants of the vast *unaltered* original wetlands of the Sacramento San Joaquin Delta.

Problem: The relict islands of the Delta which are small and scattered remnants of the original delta, are not well mapped, their stability is *not known*, and their habitat value and relationship to the aquatic system is undemonstrated. It is now recognized by the CalFed Bay-Delta Program, the San Francisco Estuary project, DWR, and DFG that these in-channel islands are valuable relicts of a complex and highly modified system. It is agreed that their function must be understood for the development and implementation of future management decisions.

Project objectives and scope: The project, as a pilot study, will provide: 1) analysis of the rate of loss (erosion) or accretion of selected in-channel islands; 2) analysis of the biological resources and dependence on the shallow water habitat surrounding the in-channel relict islands; 3) analysis of the vegetation resources and relationship to wildlife habitat types found on in-channel islands and in the shallow water surrounding the in-channel relict islands; 4) analysis and comparison of a stabilized in-channel island (Indian Slough) with unaltered or natural in-channel islands, 5) assist in a Category III application for additional study and stabilization of in channel islands of the Delta. The project will focus on the in-channel islands surrounding Webb Tract. These are selected for the diversity of conditions represented: in-channel islands exposed to long wave fetch and short wave fetch, in-channel islands along the deep water shipping channel where the depth of the bottom is maintained and the islands are exposed to heavy wave wash from vessels, and in-channel islands that are within Fisherman's Cut that are relatively protected.

The hypothesis for this proposal is that: in-channel islands represent the best "library" of information concerning the original unaltered Delta, and with present water management and recreational use the in-channel islands are threatened. The hypothesis will be tested using aerial photograph interpretation techniques and ground truthing. The project will address the following "information gaps": 1) are the in-channel islands eroding; 2) the status and habitat of

plants and animals dependent on the shallow water surrounding these relicts of the Delta; 3) particle transport and the role that biological organisms play in the stabilization or destabilization of in-channel islands; and 4) fauna presence and relative abundance associated with existing and stabilized in-channel islands.

The project team is fully capable of accomplishing all of the objectives within the time allotted. The project team consists of:

Chris K. Kjeldsen; Project director and senior scientist, Professor of Biology Sonoma State University;

Julia Clothier; Research Associate, BA Biology Sonoma State University, Master of Arts Candidate Sonoma State University (She will be responsible for the vegetation component of the study); and

Eric Tattersall, Research Associate, BA Biology UC Irvine, Eight Years as an Environmental Research Associate Harding Lawson and Associates, Novato CA, Master of Arts Candidate Sonoma State University (He will be responsible for the fauna portions of the study).

**Relict Sacramento-San Joaquin Delta In Channel Islands:
Analysis of Opportunities for Protection and Management.**

Problem Statement:

For the citizens of California the Delta is a significant resource that has a complex and sensitive physical, biological, and political environment. "The Sacramento-San Joaquin Delta is part of the most modified and intensely managed estuary in North America" (Cloern and Nichols 1985). This proposal is specifically designed to study those portions of the Delta that have, to a large degree, remained outside of the direct influence of human intervention. These are remnants of the original wetlands which have remained outside the reach of human intervention, maintenance activities, and conversion to agriculture. These in-channel islands or in-channel berms are of value not only due to their relatively unaltered state but also because of their continuity and connections within a delta system unobstructed by artificial barriers (i.e., there is free access, through the waterways, to all parts of the system for emigration and immigration, there is unimpeded water flow with runoff and tidal cycles, and the direct relationship to the aquatic environment through providing shade and allochthonous material). The habitat types found on and around these islands are Riverine Aquatic Bed, Riverine Emergent, Shrub/Scrub, Palustrine Emergent, Palustrine Forests, and Shaded Riverine Aquatic.

Many of the channels of the Delta and their in-channel islands are in a dynamic state of change due to increased wave activity and changes in water flow with water diversions.

Objectives and Scope

The project, as a pilot study, will provide: 1) analysis of the rate of loss (erosion) or accretion of selected in-channel islands; 2) analysis of the biological resources and dependence on the shallow water surrounding the in-channel relict islands; 3) *analysis of the vegetation* resources and relationship to wildlife habitat types found on in-channel islands and shallow water; 4) analysis and comparison of a stabilized in-channel island (Indian Slough) with unaltered in-channel islands; and 5) assist in a Category III application for additional study and stabilization of in channel islands of the Delta.

The project will focus on the in-channel islands surrounding Webb Tract. These are selected for the diversity of conditions represented: *in-channel islands* exposed to long wave fetch and short wave fetch, in-channel islands along the deep water shipping channel where the depth of the bottom is maintained and the islands are exposed to heavy wave wash from vessels, and in-channel islands that are within Fisherman's Cut that are relatively protected.

The hypothesis for this proposal is that: *in-channel islands represent the best "library" of information concerning the original biological environment of the Delta, and with present water management and recreational use the in-channel islands are threatened.* The hypothesis will be tested using aerial photograph interpretation techniques and ground truthing. The project will address the following "information gaps": 1) are the in-channel islands eroding; 2) the status and habitat of plants and animals dependent on the shallow water surrounding these relicts of the Delta; 3) particle transport and the role that biological organisms play in the stabilization or destabilization of in-channel islands; and 4) fauna presence and relative abundance associated with existing and stabilized in-channel islands.

The results of the above will be used to develop appropriate methods for managing in-channel islands of the waterways of the Delta.

Methods:

Thirty seven in-channel islands surrounding Webb Tract are shown in the 1977 COE Delta Atlas. These in-channel islands are subjected to wave fetch, deep water channel, and boating. Field work will be conducted April to June of 1997. Historical maps will be used to extend the information derived from the 1977 to 1991 and 1987 to 1991 aerial photographs. This will allow the assessment the rate of accretion or loss of the area and habitat supported. Aerial photographs and ground truthing will be used to verify the rates of change in size and stability of in-channel islands around Webb Tract. Elevation of the islands will be determined using standard surveying techniques from reference points on Webb Tract (it has been determined in consultation with GPS experts at Sonoma State, that the determination of elevation from tide levels as per the technique described in England and Naley, 1990 or by the use of a Global Positioning System is either inaccurate or not cost effective). Soils will be analyzed using standard techniques.

Biological habitat and use of the in-channel islands will be inventoried using standard techniques. Vegetation mapping and habitat analysis will be conducted by boat and on foot for those islands that

are traversable. Standard vegetation mapping techniques will be used where appropriate (some sites are such that transects with quadrates will be used but other sites will require modified sampling techniques). Measurements of primary production will be made to access the contribution of the in-channel islands to the aquatic system.

Specific Tasks

Task 1. Mapping of existing in-channel islands around Webb Tract and a portion of Indian Slough. This will use 1977 and 1991 photos as a base and these will be verified in the field:

- Engineered survey of elevations of the islands derived from known reference points on Webb Tract -this will be a subcontract as shown in the budget page;
- This task will include analysis of soil types (substrate);
- This task will include surrounding underwater mapping to a depth of six feet.

Time: Duration of the project.

Task 2. Analysis of physical and hydrological features of the in-channel Islands around Webb Tract and in Indian Slough:

Time: Duration of the project.

Task 3. Determination of change in area of in-channel islands. This will be done from historical photographs and verified in the field:

- This task will include analysis of the effects of wave fetch;
- This task will include observations on the effects of burrowing animals on the stability of the in-channel islands.

Time: Duration of the project.

Task 4. Determination and analysis of vegetation habitat type on each island and in surrounding shallow water. This will be done in the field using standard vegetation analysis (line transects, quadrats, and aerial photographs). This task will include:

- Vegetation inventory, distribution of native and exotic species;
- Biomass productivity;
- Analysis of Riverine Aquatic Bed;

- Comparison and correlation of vegetation at different elevations on different islands, on different substrates, and between "natural islands" and a recently stabilized island (Indian Slough).

Time: April to May.

Task 5. Determination and analysis of biological use of the shallow habitat surrounding in-channel islands. This task will include:

- field sampling;
- determination of seasonal use of the in-channel islands;
- comparison and correlation of vegetation habitat type with biological use and occurrence;
- comparison and correlation of in-channel island substrate with biota use and occurrence.

Time: April to May.

Task 6. Comparison of the biota occurrence and relative abundance within vegetation habitat types between an artificially stabilized in-channel island (Indian Slough) and "natural islands". This task will include:

- vegetation analysis;
- fauna analysis.

Time: Duration of the Project.

Task 7. Analysis of sediment and particle transport. This task will include:

- establishment of sediment traps and quadrates on a subset of the in-channel islands around Webb Tract;
- analysis of the role of animals in stabilizing or destabilizing of in-channel islands;
- analysis of vegetation structure in relation to the stability of in-channel islands.

Time: Duration of the Project.

Task 7. Special status species will be documented when and where they are encountered.

Existing data will be correlated with field studies of each site.

Time: Duration of the Project.

Task 8. Assist in a Category III application for additional study and stabilization of in channel islands of the Delta..

Time: Duration of the Project.

Coordination and Cooperative Arrangements:

DFG owned in-channel islands around Webb Tract will be studied. DFG will be consulted on all field techniques used during this study. Sonoma State and DFG research vessels will be used. California State Park Brannon Island has agreed to cooperate in waving launch and mooring fees. When appropriate DFG will provide personnel to assist in field sampling.

Reports and Manuscripts:

A final report including all the field data will be submitted to DFG. The results and finding of special-status organisms will be submitted to the National Diversity Data Base. The results of the vegetation study and the fish association with the in-channel islands will be the basis for Masters Thesis and ultimately published in scientific journals.

Available facilities:

Sonoma State University has a Research Library, Laboratory facilities and space that is sufficient to support a graduate students. Most of the work will be done in the field using the University boat. On campus computer laboratories are available for data analyses and report writing.

LITERATURE REVIEW AND LITERATURE CITED

- Atchison, Gary J. et al., 1986. Aquatic Biota Associated with Channel Stabilization Structures and Abandoned Channels in the Middle Missouri River. Environmental and water Quality Operational Studies Technical Report E-86-6, Iowa Cooperative Fishery Research Unit Iowa State University 124 Science II Ames Iowa. Prepared for COE.
- California Department of Fish and Game/ U.S. Fish and Wildlife Service. 1980. Sacramento/San Joaquin Delta Wildlife Habitat Protection and Restoration Plan.
- California Department of Water Resources and U. S. Bureau of Reclamation. November, 1990. North Delta Program Draft.
- California Department of Water Resources and U. S. Bureau of Reclamation. June, 1990. South Delta Program Draft.
- California Department of Water Resources. 1993. Sacramento Delta San Joaquin Atlas
- California State Lands Commission, 1991. Delta-Estuary California's Inland Coast: A Public Trust Report.
- California State Lands Commission, 1993. California's Rivers: A Public Trust Report.
- Cloern, J. E., and F. H. Nichols, Eds. 1985. Temporal Dynamics of An Estuary: San Francisco Bay. Hydrobiologia.
- Dennis, N. B., D. Ellis, J.R. Arnold, and D.L. Renshaw. 1984. Riparian surrogates in the Sacramento-San Joaquin Delta and their habitat Values. In Warner and K. M. Hendrix, eds., California Riparian Systems. Univ. of Calif. Press, Berkeley.
- Federal Interagency Committee for Wetland Delineation. 1989. Federal Manual for Identifying and Delineating Jurisdictional Wetlands. U. S. Army, Corps of Engineers.
- England, Sidney A., and Martha Naley. 1990. Vegetation establishment and development and avian habitat use on dredged-material islands in the Sacramento-San Joaquin River Delta: Second Annual Report -- Final Report. U.S. Army Corps of Engineers.
- England, Sidney A., and Martha Naley. 1989. Vegetation establishment and development and avian habitat use on dredged-material islands in the Sacramento-San Joaquin River Delta: Second Annual Report -- Winter and Spring 1988. U.S. Army Corps of Engineers.
- England, Sidney A., and Martha Naley. 1990. Vegetation establishment and development and avian habitat use on dredged-material islands in the Sacramento-San Joaquin River Delta: Third Annual Report -- Winter and Spring 1989. U.S. Army Corps of Engineers.
- England, Sidney A., G.S. Redpath, and Kent Nelson. 1988. Vegetation establishment and development and avian habitat use on dredged-material islands in the Sacramento-San Joaquin River Delta: First Annual Report -- Spring 1987. U.S. Army Corps of Engineers.
- Environmental Protection Agency, U.S. Fish and Wildlife Service, and U. S. D. A. Soil Conservation Service, Washington, D. C. Cooperative technical publication. 76 pp. plus appendices.
- Grinnell, Joseph, Josephs Dixon, and Jedan M. Linsdale. 1937. Fur-bearing Mammals of California. University of California Press, two Volumes, 777 pages.
- Hickman, James C., ed. 1993. The Jepson Manual Higher Plants of California. U.C. Berkeley Press.

- Herbold, B., and P. B. Moyle. 1989. The Ecology of the Sacramento-San Joaquin Delta: a community profile. U.S. Fish Wildlife Service, Biological Report 85 (7.22). xi + 106pp.
- Johnson, Barry L., William B. Richardson, and Teresa J. Naimo. 1995. Past, Present, and Future Concepts in Large River Ecology. BioScience Vol. 45. No. 3.
- Mason, Herbert L. 1957. A Flora of the Marshes of California.
- McCarten, N.F. 1989. Report on a study of sensitive plant species occurring in the littoral zone of Brannan Island State Recreation Area. Department of Biol., Univ. of Calif. Berkeley.
- McCarten, N.F. 1990a. Report on a study of sensitive plant species occurring in the Delta State Recreation Area. Department of Integrative Biol., Univ. of Calif. Berkeley.
- McCarten, N.F. 1990b. Report on a study of sensitive plant species occurring in Frank's Tract State Recreation Area. Department of Integrative Biol., Univ. of Calif. Berkeley.
- Moyle, Peter B. 1976. Inland Fishes of California. University of California Press.
- Smith, J. P. (ed.). 1984. Inventory of Rare and Endangered Vascular Plants of California. Special Publication No. 1 (3rd Edition). California Native Plant Society, Berkeley.
- State of California Department of Fish and Game, Nongame-Heritage Program. Revised October, 1989. Endangered Plant Project.
- State of California, The Resources Agency Department of Fish and Game. 1995. SB 34 Delta Levees Master Environmental Assessment.
- State of California, The Resources Agency Department of Parks and Recreation, 1991. Franks Tract State Recreation Area Preliminary Engineering Volumes I-IV.
- State of California, The Resources Agency, Department of Fish and Game. Revised October, 1989. List of State and Federal Endangered and Threatened Animals of California.
- State of California, The Resources Agency, Department of Water Resources. August, 1987. Sacramento-San Joaquin Delta Atlas.
- United States Department of the Interior, Fish and Wildlife Service, April 1988. Inventory of Heavily-Shaded Riverine Aquatic Cover. Selected Islands. Sacramento-San Joaquin Delta.
- U. S. Fish and Wildlife. 1987. Vegetation Survey conducted by boat, Richard DeHaven USFWS and Frank Wernette of CDF&G.
- United States Army, Corps of Engineers. 1979. Sacramento-San Joaquin Environmental Atlas.
- Yee, David. 1990. Field Checklist of the Birds of San Joaquin County. San Joaquin Audubon Society.

Principal Investigator:

CHRIS K. KJELDSSEN, Ph. D.
Professor of Biology
Chairman Department of Biology
Sonoma State University
1801 E Cotati Av., Rohnet Park, CA 94928
(707) 664 2189
Soc Sec No. 560-54-1036

UNDERGRADUATE EDUCATION

College of the Pacific, Stockton, California, 1957-1960; B.A. July, 1960:

Major, Botany; Minor, Education.

GRADUATE EDUCATION

University of the Pacific, Stockton, California, 1960-1962; M.S. June 1962: Major, Botany; Minor Biology.

Oregon State University, Corvallis, Oregon, 1962-1966; Ph.D. August 1966:

Major, phycology;; Specialization, marine and estuarine algae, estuarine ecology, plant physiology.

GRANTS

1969-1973 Associate Director and Director, NSF funded \$ 75,000 per year grants Field Biology and Ecology for Secondary School Science Teachers.

1976-86 Director or Co-Director BRDA, DOE and NSF funded, \$38,000 per year, in conjunction with private industry, summer institute for secondary school science teachers, Geothermal Energy, Oceans and Energy Development, and West Coast Energy Development.

1987-1989 Director, NSF funded \$216,000 grant with matching support from Hewlett Packard, PG&E and Unocal, three year program of summer institutes for secondary school science teachers on The Impact of Hazardous Materials on Humans and the Environment.

1989- Director \$20,000 grant from California Division of Forestry-Jackson State Demonstration Forest: Study of vegetation Succession in Redwood Clear-cuts.

OTHER EXPERIENCE

- 1970- Elected to the Board of Directors of: Californians Organized to Acquire Access to State Owned Tidelands. This was the Parent organization for Proposition 20 the California Coastal Conservancy Act.
- 1972- Elected Chairman of the board of Directors of COAST.
- 1973-76 Appointed by Board of Supervisors Sonoma County to the Sonoma County Planning Commission and Board of Zoning Adjustments.
- 1976 Chairman, Sonoma County Planning Commission.
- 11981-83 Appointed by Sonoma County Board of Supervisors to the Sonoma County Energy Advisory Committee.
- 1983-86 Appointed by Sonoma County Board of Supervisors to the Sonoma County Hazardous Materials Management Committee. Served on the Executive Steering Committee for one year and on the Alternate Disposal subcommittee.
- 1986--- Appointed by Sonoma County Board of Supervisors to the Sonoma County Hazardous Materials Commission. 1987, Elected Vice Chairman; 1986-1988 chair of the Goals and Policies sub-committee.
- 1988 Reviewer for Aquatic Habitat Institute, " San Francisco Bay Macro algae Studies."
- 1988-89 Chairman, Sonoma County Hazardous Materials Commission.

GRADUATE STUDENT SUPERVISION

The following graduate students have completed their Masters Degree Thesis option under my supervision: Anne Rudee, Marion Rotnicki, Kathryn Miller, Gary Schusta, Russel Amaru, Wm Andrews, Marilyn Cannon, Robin Fantly Hayes, and Naomi Phillips. Three students have theses in progress. All of these students have worked on estuarine or aquatic problems.

SABBATICAL LEAVES

- 1976 Eight-month Sabbatical leave studying nitrogen fixation by cyanobacteria on estuarine and marine mudflats at the Menai Bridge Marine Station, University College of North Wales, Bangor, Gwynedd, United Kingdom. This work was done with Professors Fogg and Walsby.
- 1978-79 On Leave from Sonoma State as a rotator. Assigned to the U.S. Department of Energy Washington, D.C., Office of Education, Business and Labor Affairs, Education Programs Division.
- 1989-90 Sabbatical leave studying local marine algae, UC Berkeley Herbarium and enhancement of Plant Physiology teaching.
- 1996 Sabbatical leave studying marine algae and fungi of Honduras, CA., Sacramento-San Joaquin Delta and Lichens of the North Coast of California.

CALIFORNIA STATE UNIVERSITY SYSTEM WIDE SERVICE

- 1969 Appointed to membership on the Central Coordinating Committee of CCHE on Marine Resources for Higher Education.
- 1976-78 Technical Advisor to the California Coastal Commission, Estuarine Sanctuary Advisory Panel.
- 1985--- Sonoma State Representative to the CSU/PG&E Partnership Committee.
- 1989 Program Reviewer; five year review: Biology Department California State University Domingues Hills.

PUBLICATIONS

1. Kjeldsen, C. K. 1970. Terrestrial Flora of Salt Point Part I.; Marine Flora of Salt Point Part II. Salt Point State Park Resource Assessment. Grant contract with California State Parks Department and Pine Olivet School District.
2. Kjeldsen, C. K. , 1972. Pleurophyous gardnerii Setchell and Saunders, a New Alga from Northern California. Madrono, Vol 21 # 6, April.
3. Kjeldsen, C. K. and H. K. Phinney, 1972. The effects of variations in salinity and temperature on some estuarine macro-algae. Published in the Proceedings of the VII International Seaweed Symposium, p. 301-308.
4. Kjeldsen, C. K. and H.K. Phinney, 1973. Marine macro-algae of Yaquina Bay and Estuary. Madrono Vol. 22 #2, April pp 85-94.
5. Kjeldsen, C. K. 1974 to 1989. A Checklist of the Marine Algae in the Vicinity of Sonoma state University: Marin, Sonoma and Mendocino Counties. Literature citations, ecological data and collecting records, 86 pp xeroxed.
6. Kjeldsen, C. K. 1970-73. Prepared four EIR-EIS Reports ranging from 20 to 75 pages on land use and sewage disposal for the engineering firm of Dentoni and Associates, Stockton California.
7. Kjeldsen, C. K. and A. E. Walsby, 1977. Nitrogenase Activity in a Marine Blue-Green Mudflat Community, abstract published in the Journal of Phycology. Paper presented at the IX th International Seaweed Symposium Santa Barbara California.
9. H. W. Pearson, Howsley, C. K. Kjeldsen and A. E. Walsby, 1979. Aerobic Nitrogenase Activity Associated with a Non-Heterocystous filamentous Cyanobacterium. Federation of European Microbiological Societies (#5) pp. 163-167.
10. Kjeldsen, C. K., 1979. Vegetation and Ecology of Three Anthropological Sites in the Mendocino National Forest. SSU Department of Anthropology Study for the U. S. Forest Service.
11. Kjeldsen, C. K., 1981, Waste Disposal from Geothermal Energy Systems; paper presented at Argonne National Laboratory Conference on Energy Production Wastes. This was an invited one-hour presentation.

12. Kjeldsen, C. K., Richard Bennett, Forrest Dunlap, Editors, 1983. Sonoma County Energy Assessment. Document produced for the Sonoma County Board of Supervisors.
13. Kjeldsen, C. K., Vincent Hoagland, Robert Rubin, Wm Andrews and Joe Brumbaugh, 1989. Hazardous Materials: A Subject for Integrating Science Disciplines, Technology and Society. Abstract and poster session presented at the 1989 meeting of AAAS San Francisco.
15. Kjeldsen, C. K. and John R Arnold. 1991 Habitat Values A position paper presented to the third Riverine Conference Sacramento Ca.
16. Kjeldsen, C. K. 1993. Sargassum muticum an introduced weed on the outer coast of central California paper submitted to Madrono.

LECTURES AND SCHOLARLY PRESENTATIONS

- 1977 Panelist, League of Women Voters, Panel on Geothermal Energy.
- 1978 Chairman of Session, Geothermal Symposium, California Energy Commission, Sacramento California.
- 1978 Chairman of GRIPS (Geothermal Resources Impact Program Study) Session on Vegetation; Ecosystem Assessment Workshop, October 25-27.

FEDERAL PROGRAMS

- 1978-80 Reviewer, U.S. Department of Energy, Faculty Development Program Grants. One-day panel review and evaluation as the basis for awarding funds.
- 1979 Director, DOE Faculty Development Meeting, Washington D.C. two days, 84 participants.
- 1980 Consultant, U.S. DOE, Faculty Development Program (one week), Washington D.C.

CONSULTING

- 1969-73 DENTONI AND ASSOCIATES, civil engineer, Stockton California, vegetation analysis Delta College, Land Disposal of Sewage.
- 1984 UNION OIL COMPANY, consultant/technical report reviewer, Geothermal emissions effect on vegetation.
- 1987 CH2M Hill, Oxidation pond algae.
- 1989- Consultant for 31 Reclamation Districts in the Delta Developing Habitat Assessments for California Department of Fish and Game SB 34 program. Each of these reports is about 40 pages long with maps and photographs.
- 1992-Pres. Harding Lawson and Associates, Analysis of Impacts on Marine Intertidal of Fitzgerald Marine Reserve, San Mateo County. Client: San Mateo Board of Supervisors.

- 1991-Pres. Jim Hansen Engineering, Habitat Analysis for special-status species in water diversion projects.
- 1992- Pres E & J Gallo Winery, Flora and Fauna of Litton Springs Ranch.
- 1991-Pres. Napa Valley Vineyards Engineering, Habitat Analysis for special-status species in water diversion projects.
- 1993 Harding Lawson and Associates, Analysis of Habitat Loss as a result of SB 34 Subvention Funding on Levees of the Sacramento San Joaquin Delta. Client: Department of Fish and Game and Department of Water Resources.

PROFESSIONAL ORGANIZATIONS

Member ANBS, AAAS, International Phycological Society, American Phycological Society, California Native Plant Society, San Francisco Estuarine Society, California Lake Management Society, San Francisco Mycological Society, Sonoma County Mycological Association.

BUDGET

CHRIS K. KJELDTSEN, Ph. D.
Professor of Biology, Department of Biology
Sonoma State University

Salaries & Wages

Project Director, C. Kjeldsen

(4 unit Replacement); grad TA replacement=3,492

This represents a Cost Sharing by Sonoma State University of \$6,124.

Four units at full professor = \$9,516 (\$9,516 - \$3,492 Graduate TA
Replacements for Kjeldsen's Services = \$6,000).

3,492

Graduate Assistants (Two Research Stipends 10,000 ea. one and one-half years)
Masters of Arts Candidates:

Eric Tattersall

Julie Clothier

5,500

5,500

Total Salaries & Wages

14,492

Salaries & Wages Fringe Benefits
@ 10%

1,478

Total Salaries and Fringe Benefits

15,970

Expendable Materials & Supplies

Field Supplies

Report Duplication & Photographs

Total Materials & Supplies

2,500

Travel & Per Diem

University Pick-up Truck & Boat Trailer

2,000

Other Direct Costs

University Research Boat

& Fuel at study site

Total

1,200

Total Direct Costs

21,670

Indirect Costs

15% of Total Direct Costs (Standard Agreement with SSU Foundation)

(25% indirect costs if Sacramento University Services Program

Interagency Agreement = \$5,055) this changes the budget total to
\$ 26,725.

3,250

TOTAL PROJECT COSTS

\$24,900